Check List the journal of biodiversity data

ANNOTATED LIST OF SPECIES

Check List 15 (1): 209–218
https://doi.org/10.15560/15.1.209

PENSOFT

Survey of medium-sized and large mammals in semideciduous Atlantic Forest patches near Alfenas, southern Minas Gerais, Brazil

Ana Raíssa Cunha Costa[1], Marcelo Passamani[2], Rogério Grassetto Teixeira da Cunha[1]

1 Universidade Federal de Alfenas, Instituto de Ciências da Natureza, Rua Gabriel Monteiro da Silva, 700, CEP 37130-001, Alfenas, MG, Brazil.
2 Universidade Federal de Lavras, Departamento de Biologia, Caixa Postal 3037, CEP 37200-000, Lavras, MG, Brazil.
Corresponding author: Rogério Grassetto Teixeira da Cunha, rogeriograssetto@gmail.com

Abstract

We surveyed, with the aid of camera traps, medium-sized and large terrestrial mammals in 8 patches of semideciduous Atlantic Forest near the city of Alfenas, Minas Gerais, Brazil. We recorded species occurrence using 2 camera traps per fragment, which were simultaneously active for 2 months each. We recorded 16 species, plus a species of armadillo that we were unable to identify to genus. The rarefaction curve tended to stabilize, evidencing the efficacy of our methods. The species richness was similar or higher to other surveys carried out in remnants of seasonal semideciduous Atlantic Forest or transitional areas. However, such seemingly high richness in a severely degraded and fragmented region, including large carnivores and endangered species, hides a wide variation in richness among fragments. This calls for urgent actions to improve the landscape for these animals to ensure their survival in the long term, as some populations are probably not viable in the long run.

Key words

Atlantic Forest, camera traps, Cerrado, checklist, fragmentation.

Academic editor: Guilherme Garbino | Received 21 September 2018 | Accepted 2 January 2019 | Published 15 February 2019

Citation: Costa ARC, Passamani M, Cunha RGT (2019) Survey of medium-sized and large mammals in semideciduous Atlantic Forest patches near Alfenas, southern Minas Gerais, Brazil. Check List 15 (1): 209–218. https://doi.org/10.15560/15.1.209

Introduction

Forested areas worldwide have been suffering from changes due to intense land use associated with economic development, which has increased the amount of cultivated and urban areas, as well as road networks (Costa et al. 2005). These changes usually involve severe habitat reduction and the division of remnant areas into smaller habitat patches, which are usually isolated and surrounded by an altered landscape (the matrix), a process called fragmentation (Wilcove et al. 1998).

The Atlantic Forest in Brazil is no exception to this pattern, with less than a third of its original forest cover remaining (Ribeiro et al. 2009, Resende et al. 2018). Even worse, most Atlantic Forest remnants are not pristine. They are small forest patches at distinct regeneration stages, as only 7.9% of the patches are larger than 100 ha (Ribeiro et al. 2009, Fundação SOS Mata Atlântica and INPE 2015). Furthermore, although the "interior" subregion (largely comprised of seasonal semideciduous forest) originally occupied the largest area of the Atlantic Forest, currently only 7% of the original forest in this subregion remains (the second worst scenario among the subregions) (Ribeiro et al. 2009).

Even with its reduced and fragmented area, the Atlantic Forest is one of the most biodiverse ecosystems

Copyright *Costa et al.* This is an open access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

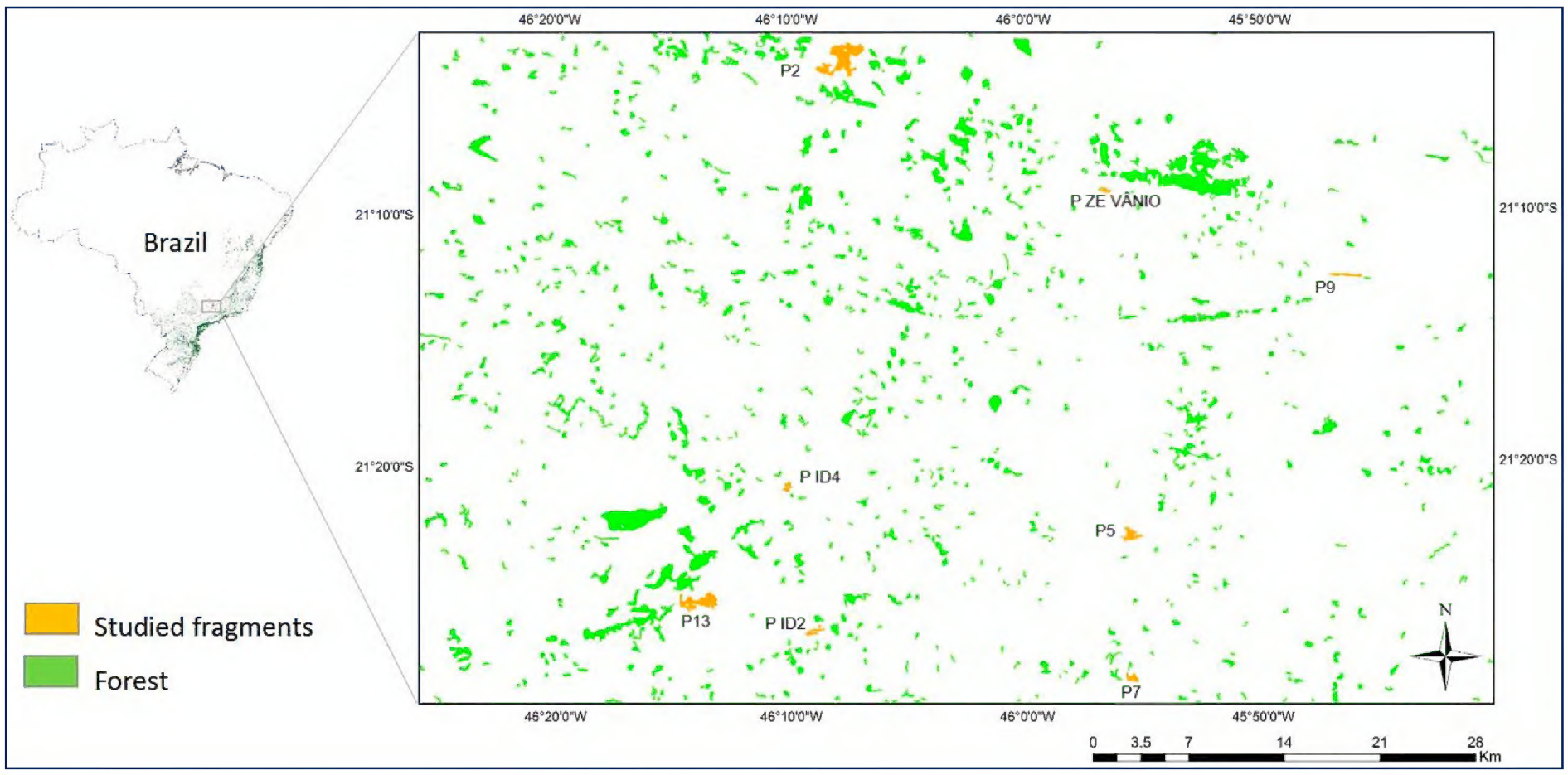

Figure 1. Location of the 8 sampling sites in southern Minas Gerais, Brazil.

of the world, harboring many endemic and/or threatened species (Pinto et al. 2006).

Among vertebrates, mammals are among the groups most affected by forest fragmentation and destruction of natural habitats (Chiarello 1999, Cullen et al. 2001, Galetti et al. 2009). In this context, several mammal species in the Atlantic Forest are Vulnerable (threatened with extinction) (MMA 2014). Nonetheless, many areas, including protected regions, lack species lists or have not been surveyed at all (Cerqueira 2001). The medium-sized and large mammals of Atlantic Forest are affected by fragmentation (Ceballos et al. 2005, Costa et al. 2005), as they have a low reproductive rate, have large home ranges (Cardillo et al. 2005, Ceballos et al. 2005, Costa et al. 2005, Galetti et al. 2009), and are subject to hunting (Kasper et al. 2007, Araújo et al. 2008, Brocardo et al. 2012, Brocardo and Cândido-Júnior 2012). Even so, they are still found in many small remnants of seasonal semideciduous Atlantic Forest (Eduardo and Passamani 2009, Penido and Zanini 2012, Pires and Cademartori 2012, Magioli et al. 2014, Santos et al. 2016, Melo-Dias and Passamani 2018).

Thus, our study aims to survey medium-sized and large terrestrial mammals in 8 seasonal semideciduous Atlantic Forest remnants in a highly fragmented landscape in southern Minas Gerais, Brazil. This state has been poorly studied and has a shortage of systematic survey data. It has suffered extensively from the process of fragmentation and, even nowadays, is not free of threats. Thus, gathering basic inventory data is an essential step to support conservation and management projects.

Methods

Study sites. We carried out the study in 8 sampling patches of seasonal semideciduous Atlantic Forest (Fig. 1). The sampling sites needed to have between 20 and 40% forest cover within a buffer of 2 km^2 around the fragment and have an associated matrix of pasture. All fragments were in a highly fragmented landscape in southern Minas Gerais, Brazil, in a region that is severely degraded and fragmented, dominated by pasture, and coffee, sugar cane and corn plantations (Ayer et al. 2015, Olivetti at al. 2015). All fragments were private land, and we obtained permission from landowners before placing the camera traps.

Data collection. We employed camera traps (Bushnell 8 MP Trophy Cam Trail Camera) to record the occurrence of mammals within the fragments (Tomas and Miranda 2003). We sampled each fragment continuously for 2 months, employing 2 camera traps per fragment. Within the fragments, we placed the camera traps turned towards preexisting trails, when available, 1–3 m away from them. When there were no available trails, we placed the 2 cameras apart from each other, in central parts of the fragment, preferably in areas showing good forest quality (higher canopy and less undergrowth cover). We programmed the traps to take 3 photographs each time they were triggered, with a 1-minute interval before resetting the trigger. Sampling effort was calculated by multiplying the number of traps in each fragment by the number of fragments by 60 (number of sampling days). The sampling effort amounted to 960 camera trap days, yielding 186 images of mammals.

Data analysis. To verify if the sampling period was enough to record the richness of mammals across the landscape, we generated a species accumulation curve for the 60 sampling days, with a 95% confidence interval. We computed the curve using the software ESTIMATES and employed the estimator Jacknife 1 (Colwell et al. 2004).

Mammal classification. Species nomenclature follow Paglia et al. (2012), except for *Leopardus guttulus*, which follows Trigo et al. (2013). We also classified each

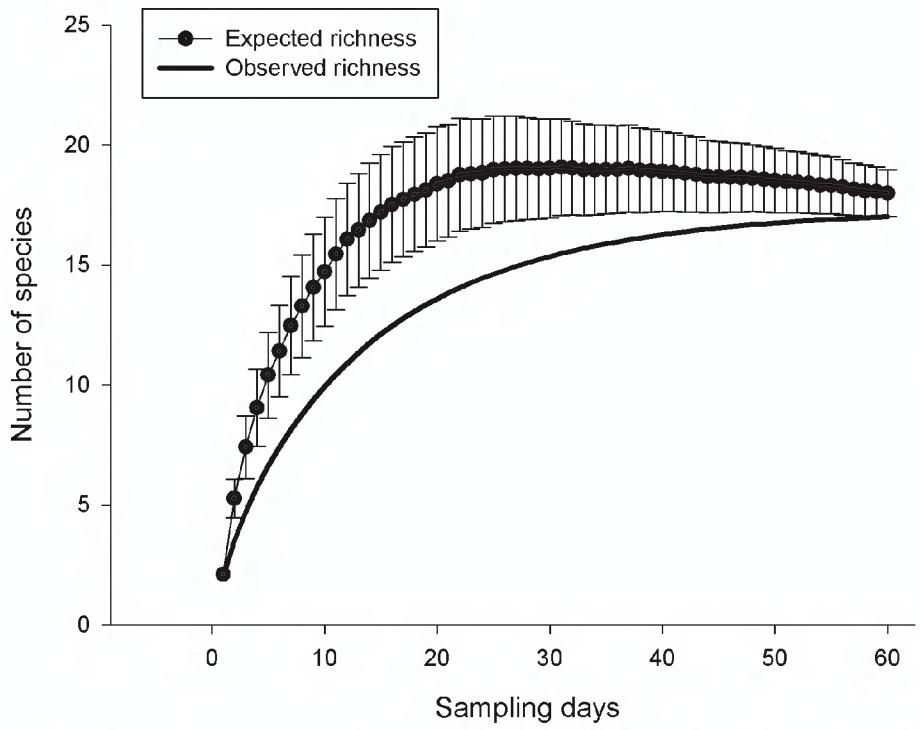

Figure 2. Species accumulation curve for the community of medium-sized and large mammals in 8 landscapes of semideciduous Atlantic Forest remnants near Alfenas, southern Minas Gerais, Brazil, based on 60 days of sampling with camera traps. Observed richness in red, expected richness in black, and their 95% confidence intervals. To compute this curve, we considered that we had another armadillo species (*Euphractus sexcinctus* or *Cabassous unicinctus*), which was definitely not the species already identified (*Dasypus novemcinctus*).

species according to its conservation status (IUCN Red List categories) at 3 levels, based on the official Red Lists of endangered species: regionally, for the state of Minas Gerais (COPAM 2010) and Brazil (MMA 2014), and globally (IUCN 2018). We considered mammals weighing over 1 kg to be as medium-sized and large (Chiarello 2000b), included only native species, and excluded records of domestic species.

Results

We recorded 16 medium-sized and large mammal species, from 8 orders and 11 families (Table 1). We also recorded an additional species of armadillo, which we could not determine if it belonged to genus *Euphractus* or *Cabassous*. Considering all sampling sites, the rarefaction curve tends to stabilize (Fig. 2). The recorded species richness is representative of the areas, estimating approximately 95% of the species expected in the areas. Only *Myrmecophaga tridactyla* and *Leopardus guttulus* are globally threatened (IUCN 2018), while 4 species are threatened in Brazil (MMA 2014; Table 1); all the recorded species that are classified under some threat category in the Brazilian list, plus *Leopardus pardalis*, are threatened in the Minas Gerais state list (COPAM 2010; Table 1).

Order Didelphimorphia
Family Didelphidae

***Didelphis albiventris* Lund, 1840**
Figure 3A

Material examined. Table 1.

Identification. A medium-sized opossum, grayish with a paler face with 3 conspicuous black stripes, 1 on the middle of the forehead and the other 2 above the eyes. White ears clearly distinguish it from *Didelphis aurita*.

***Didelphis aurita* (Wied, 1826)**
Figure 3B

Material examined. Table 1.

Identification. A medium-sized opossum, dorsally grayish with inconspicuous facial stripes and black ears.

Order Lagomorpha
Family Leporidae

***Sylvilagus brasiliensis* (Linnaeus, 1758)**
Figure 3C

Material examined. Table 1.

Identification. A medium-sized rabbit, and the only species of the genus occurring in the study area.

Order Pilosa
Family Myrmecophagidae

***Myrmecophaga tridactyla* Linnaeus, 1758**
Figure 3D

Material examined. Table 1.

Identification. The Giant Anteater is the only species of genus *Myrmecophaga*. Its large size, long and furry tail, the large black stripe running from its throat towards its back, bordered by a thin white stripe, and its long and pointy snout make this species clearly distinct from any other in the region.

***Tamandua tetradactyla* (Linnaeus, 1758)**
Figure 3E

Material examined. Table 1.

Identification. The Collared Anteater is the only species of its genus occurring in Brazil. Its medium-sized body, short fur with 2 clear black scapular stripes and its long snout make this species easily recognizable.

Table 1. Coordinates and size of the studied forest fragments in southern Minas Gerais, Brazil.

	P ID4	P13	P7	P2	P ID2	P5	P ZE VÂNIO	P9
Coordinates†	–21.3493, –46.1686	–21.4232, –46.2312	–21.4766, –45.9262	–21.0651, –46.1298	–21.4462, –46.1490	–21.3822, –45.9262	–21.1539, –45.9442	–21.2113, –45.7718
Size (ha)	25.7	200.1	41.1	447.2	79.8	81.6	42.6	58.4

†Coordinates were taken from the centroid of each fragment.

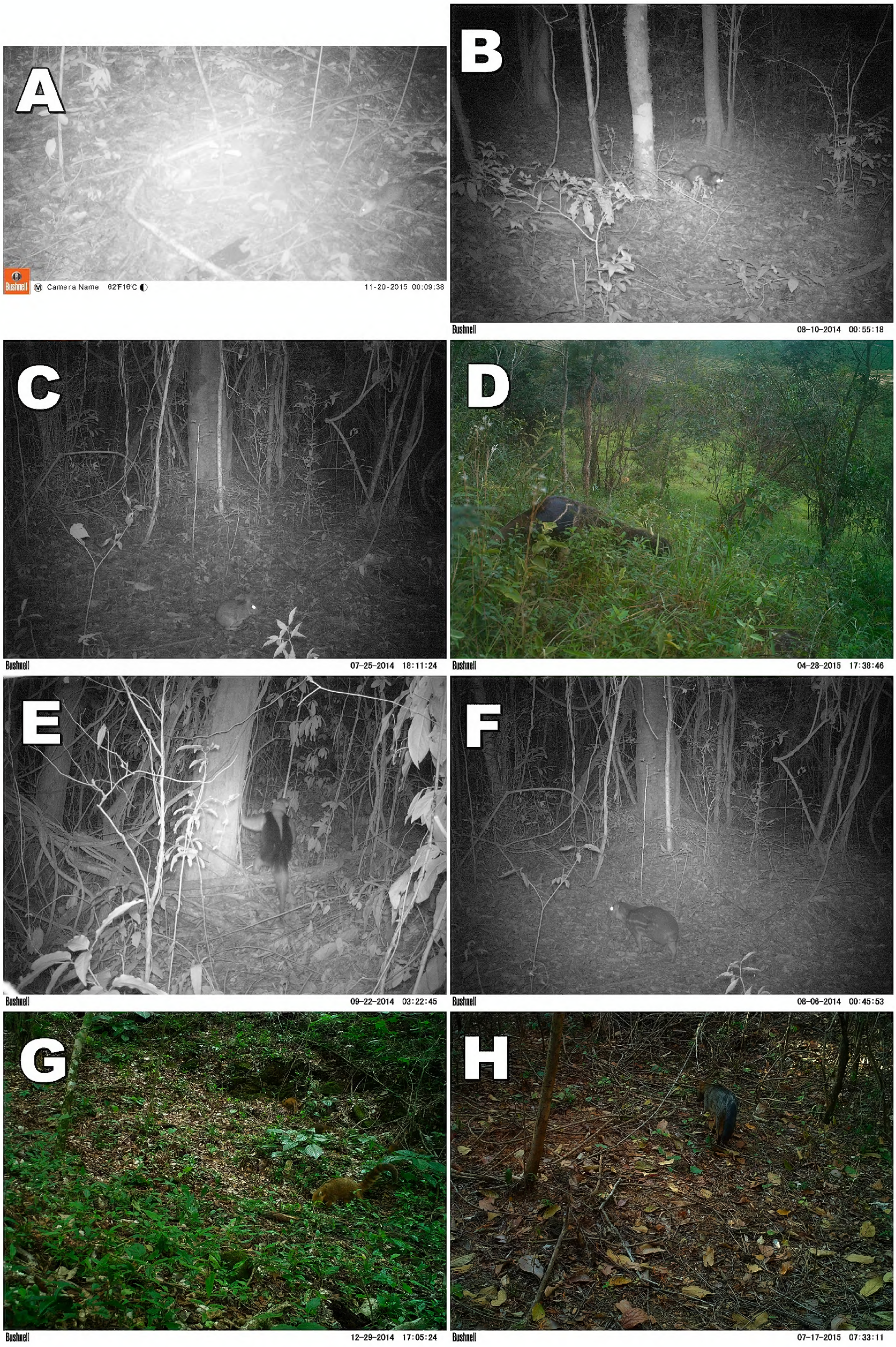

Figure 3. Native mammal species identified using camera traps in 8 landscapes of semideciduous Atlantic Forest remnants in the vicinity of Alfenas, southern Minas Gerais, Brazil. **A.** *Didelphis albiventris* Lund, 1840. **B.** *Didelphis aurita* (Wied, 1826). **C.** *Sylvilagus brasiliensis* (Linnaeus, 1758). **D.** *Myrmecophaga tridactyla* Linnaeus, 1758. **E.** *Tamandua tetradactyla* (Linnaeus, 1758). **F.** *Cuniculus paca* (Linnaeus, 1766). **G.** *Nasua nasua* (Linnaeus, 1766). **H.** *Cerdocyon thous* (Linnaeus, 1766).

Order Rodentia
Family Cuniculidae

***Cuniculus paca* (Linnaeus, 1766)**
Figure 3F

Material examined. Table 1.

Identification. The Spotted Paca is the only medium-sized rodent in the region. It has a small tail, and short, homogeneous fur that is usually brown, with a pattern of white spots arranged in longitudinal rows.

Order Carnivora
Family Procyonidae

***Nasua nasua* (Linnaeus, 1766)**
Figure 3G

Material examined. Table 1.

Identification. *Nasua nasua* is the only species of coati that occurs in the region. It is a medium-sized procyonid, with a triangular head, long and pointed snout and short ears. This species has a brownish to orangish color with a black-ringed tail. Its face is darker, with an incomplete white ring around the eyes.

Family Canidae

***Cerdocyon thous* (Linnaeus, 1766)**
Figure 3H

Material examined. Table 1.

Identification. *Cerdocyon thous* is a short, robust, medium-sized canid. It has short and round ears and a long furry tail. The general color pattern is gray, but darker in the nape. It can be confused with *Lycalopex vetulus*, which is less common, prefers open areas in the Cerrado biome, and has longer ears, a longer snout and a slightly lighter color.

***Chrysocyon brachyurus* (Illiger, 1815)**
Figure 4A

Material examined. Table 1.

Identification. *Chrysocyon brachyurus* is a large canid with an orangish-brown color, long and dark limbs, large ears and a long snout. These observable characters make this species clearly distinct from any other in the region.

Family Felidae

***Leopardus guttulus* (Hensel, 1872)**
Figure 4B

Material examined. Table 1.

Identification. *Leopardus guttulus* is a small felid. It has a yellow to brown pelage, with rows of black ocellated spots that may form open rings.

***Leopardus pardalis* (Linnaeus, 1758)**
Figure 4C

Material examined. Table 1.

Identification. *Leopardus pardalis* is a medium-sized felid. Its pelage is dorsally yellow with black ocellated spots, which form open rosettes that unite in longitudinal bands over the sides of the body. It is clearly distinguishable from the other medium-sized felid that occurs in the region, *Puma yagouaroundi*, which is uniformly grayish-brown.

***Puma concolor* (Linnaeus, 1771)**
Figure 4D

Material examined. Table 1.

Identification. *Puma concolor* is a large felid with short, round ears and a long tail. Its pelage is light brown to reddish with whitish ventral parts.

Family Mustelidae

***Eira barbara* (Linnaeus, 1758)**
Figure 4E

Material examined. Table 1.

Identification. *Eira barbara* is a medium-sized mustelid with a long body and neck, short, dorsoventrally flattened, head and short, round ears. Its pelage is dark brown with the head lighter than the dorsum and a whitish spot on the throat. The tail is long, dark and has long hairs.

Order Artiodactyla
Family Cervidae

***Mazama americana* (Erxleben, 1777)**
Figure 4F

Material examined. Table 1.

Identification. *Mazama americana* is a medium-sized cervid with short ears in relation to the size of the head. Its body has an overall reddish color, with a more grayish head and neck. The hips are robust and slightly taller than the shoulders.

Order Primates
Family Cebidae

***Sapajus nigritus* (Goldfuss, 1809)**
Figure 4G

Material examined. Table 1.

Identification. *Sapajus nigritus* is a medium-sized primate with an overall brown to dark brown color, a pigmented and hairless area on the face, lighter areas on the cheeks and temples and a developed and black tuft on the top of the head. It also has a long, dark tail.

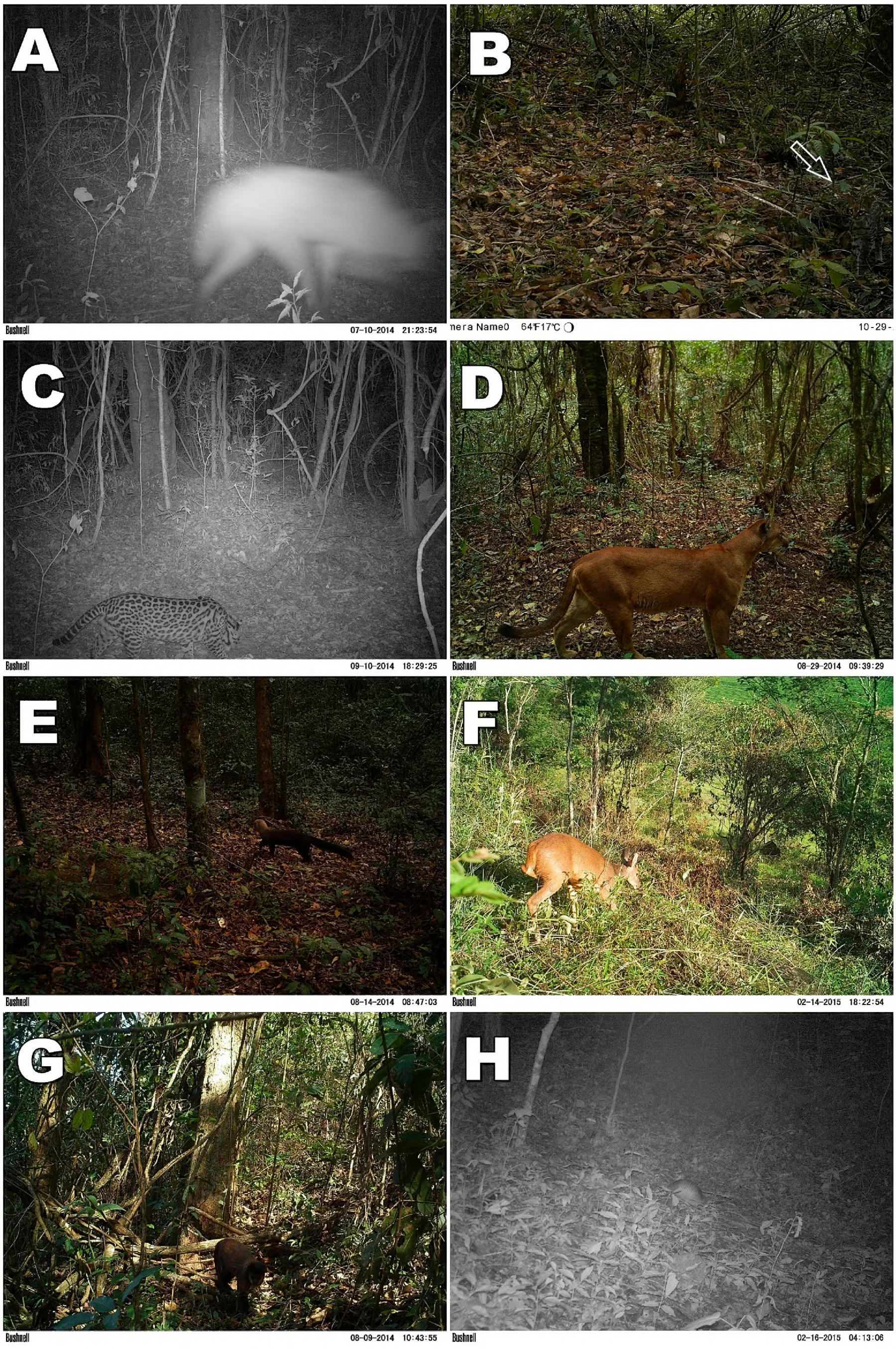

Figure 4. Native mammal species identified using camera traps in 8 landscapes of semideciduous Atlantic Forest remnants near Alfenas, southern Minas Gerais, Brazil. **A.** *Chrysocyon brachyurus* (Illiger, 1815). **B.** *Leopardus guttulus* (Hensel, 1872). **C.** *Leopardus pardalis* (Linnaeus, 1758). **D.** *Puma concolor* (Linnaeus, 1771). **E.** *Eira barbara* (Linnaeus, 1758). **F.** *Mazama americana* (Erxleben, 1777). **G.** *Sapajus nigritus* (Goldfuss, 1809). **H.** *Dasypus novemcinctus* Linnaeus, 1758.

Order Cingulata
Family Dasypodidae

***Dasypus novemcinctus* Linnaeus, 1758**
Figure 4H

Material examined. Table 1.

Identification. *Dasypus novemcinctus* is a medium-sized armadillo with body armor with 9 mobile, back bands. It has long ears and a tail with rings of scales.

Discussion

In the 8 sampled fragments, we found 16 medium-sized and mammal species, which belong to 8 orders and 11 families (Table 1), plus an additional armadillo species whose identification could not be confirmed (either *Euphractus sexcinctus* or *Cabassous unicinctus*). This species richness recorded is similar or higher to other surveys carried out in remnants of seasonal semideciduous Atlantic Forest or transition physiognomies (Table 3). Although some studies have reported a higher number, all of them recorded species with more than a single method, which usually included camera traps. Probably, if we had done the same, more species would have been recorded. For example, we are aware of the presence of 2 primates in the region (*Callithrix aurita* and *Callicebus nigrifrons*; Silva et al. 2015) that were not recorded by the cameras. Our study had the highest number for species recorded using camera traps alone, which shows that our methodology was efficient at sampling the species in the region.

However, the total number of species recorded is somewhat misleading. Our total richness was computed for the set of 8 fragments considered together, while the majority of the aforementioned studies were conducted in single fragments. Thus, our result masks the fact that fewer species were recorded in each fragment. Besides, there is also a large variation in richness among fragments. For example, at one extreme, a fragment (not particularly large or with good forest quality) had 13 species and 2 single records of large carnivores (*Puma concolor*

Table 2. List of medium-sized and large mammals recorded in each studied forest fragment in southern Minas Gerais, Brazil, classified according to IUCN Red List categories: (VU) Vulnerable, (NT) Near Threatened, (LC) Least Concern, (DD) Data Deficient. IUCN Red List categories were assigned to each species according to the IUCN (2018) Red List ($_{IUCN}$), Brazil's Red List ($_{BR}$) (Ministério do Meio Ambiente 2014) and the Minas Gerais Red List ($_{MG}$) (COPAM 2010); abbreviation for these different Red List classifications are presented in subscripts after the categories.

Species list	IUCN Red List category	Study sites								No. of fragments where found
		P ID4	P13	P7	P2	P ID2	P5	P ZE VÂNIO	P9	
Order Didelphimorphia										
Didelphis albiventris	LC_{IUCN}	X			X			X		3
Didelphis aurita	LC_{IUCN}		X	X						2
Order Lagomorpha										
Sylvilagus brasiliensis	LC_{IUCN}	X		X	X			X		4
Order Pilosa										
Myrmecophaga tridactyla	$VU_{IUCN, BR, MG}$				X			X	X	3
Tamandua tetradactyla	LC_{IUCN}		X	X						2
Order Rodentia										
Cuniculus paca	LC_{IUCN}			X		X				2
Order Carnivora										
Nasua nasua	LC_{IUCN}	X		X			X			3
Cerdocyon thous	LC_{IUCN}							X		1
Chrysocyon brachyurus	NT_{IUCN} $VU_{BR, MG}$			X						1
Leopardus guttulus	$VU_{IUCN, BR, MG}$	X	X	X	X					4
Leopardus pardalis	LC_{IUCN} VU_{MG}			X	X			X		3
Puma concolor	LC_{IUCN} $VU_{BR, MG}$			X						1
Eira barbara	LC_{IUCN}			X		X				2
Order Artiodactyla										
Mazama americana	DD_{IUCN}	X	X	X					X	4
Order Primates										
Sapajus nigritus	NT_{IUCN}		X			X				2
Order Cingulata										
Dasypus novemcinctus	LC_{IUCN}	X		X[†]					X	3
Richness per fragment		6	5	13	5	3	1	5	3	

[†]In this fragment we identified another armadillo, which was not a species of *Dasypus*; it was not possible to determine if it was *Euphractus sexcinctus* or *Cabassous unicinctus*.

Table 3. Richness of medium-sized and large-sized mammals in surveys carried out in remnants of seasonal semideciduous Atlantic Forest or transition physiognomies (between open cerrado and forested formations).

No. of species	Locality	Municipality, state	No. of surveyed fragments	Reference
11	Fragment in urban área of municipality of Jataí	Jataí, Goiás	1	Bernardo and Melo, 2013
13	Serra do Carrapato	Lavras, Minas Gerais	5	Silva and Passamani 2009
15	Reserva Biológica Municipal de Santa Rita do Sapucaí (RBSRS)	Santa Rita do Sapucaí and São Sebastião da Bela Vista, Minas Gerais	1	Eduardo and Passamani 2009
15	Morro do Coco	Viamão, Rio Grande do Sul	1	Pires and Cademartori 2012
17	Several	Alfenas, Areado, Cabo Verde, Campo do Meio, Campos Gerais and Carmo do Rio Claro	8	This study
18	Area of Ecological Interest "Matão de Cosmopolis"	Cosmópolis and Artur Nogueira, São Paulo	1	Magioli et al. 2014
19	Quedas do Rio Bonito Ecological Park	Lavras, Minas Gerais	1	Santos et al. 2016
19	Several	Carrancas, Minduri, Luminárias, Nazareno and Itutinga, Minas Gerais	—	Machado et al. 2017
20	Estação de Pesquisa, Treinamento e Educação Ambiental (EPTEA) Mata do Paraíso	Viçosa, Minas Gerais	1	Prado et al. 2008
20	Campus of the Federal University of Lavras	Lavras, Minas Gerais	1	Melo-Dias and Passamani 2018
21	Estação Ecológica Mata do Cedro	Carmópolis de Minas, Itaguara and Cláudio, Minas Gerais	1	Penido and Zanini 2012
30	PELD/Jataí Long-Term Ecological Monitoring Project	Aporé and Itajá, Goiás	2	Calaça et al. 2018

[†]The definition of what is a medium-sized and large mammal may vary from study to study.

and *Chrysocyon brachyurus*). At the other end of the spectrum, in another fragment we recorded only 1 species of mammal (*Nasua nasua*). The latter fragment was highly degraded, with an undergrowth dominated by a thorny *Acacia* (Fabaceae) species, and it did not have trails. The presence of the coati may be due to the highly generalist diet of this species, which may include garbage (Alves-Costa et al. 2004). Whatever the reason for this expressive variation, this result highlights the need for simultaneous surveys of several fragments in similarly fragmented areas. Otherwise, there is the risk of having a biased estimate of the fauna of a given region, underestimating it, or worse, overestimating it and giving the impression of a brighter picture than reality. Another caveat is that sampling in some fragments may not have provided the most accurate documentation of the fauna. In 2 fragments we observed 1 (P ID2) and 5 (P ID4) additional species in the bordering pastures, although there were no new species for the regional set. Thus, we suggest conducting longer sampling periods and including more locations at each site.

Regarding IUCN Red List categories, only 2 species are classified as Vulnerable on the IUCN Red List (IUCN 2018): *Myrmecophaga tridactyla* and *Leopardus guttulus*. However, in the Brazilian list of threatened mammals (MMA 2014), more species are classified as Vulnerable, including 3 carnivores. All carnivores find food and shelter within the remnants (Costa et al. 2005) and, without the fragments they could disappear from the region due to the ongoing threats. For the Minas Gerais state list (COPAM 2010), we found all species classified in the Brazilian list plus *Leopardus pardalis*, which is mainly threatened by roadkills, deforestation, habitat loss, and predation by invasive and exotic species (Costa et al. 2005). In addition, *Leopardus guttulus* is classified at a higher risk level on the state list. Overall, nearly half of the recorded species are at some threat level, which points to the importance of these unprotected fragments in the maintenance of the regional fauna. In our survey, we did not record some species that were found in similar surveys, such as *Puma yagouaroundi*, *Lontra longicaudis*, *Hydrochoerus hydrochaeris* (the previous 2 probably because we did not have any large bodies of water close to the studied fragments), and *Mazama gouazoubira*.

Overall, our results can be seen from 2 different perspectives. On the one hand, although the region is severely degraded and fragmented, it still harbors a significant fauna of medium-sized and large mammals, including large carnivores and endangered species. This calls for urgent actions to improve the situation of the landscape for these animals to ensure their survival in the long term, as some populations are probably not viable in the long run. On the other hand, such variation in the number of species among the fragments is a serious warning that the situation may be far worse than the overall list might indicate. Some fragments seem to be almost devoid of medium-sized and large, and some species are restricted to only 1 or a few fragments, which reinforces the need for specific conservation and management actions. One action could be to improve landscape connectivity, as most fragments are isolated. The establishment of ecological corridors or stepping stones is a possible alternative, although their effectiveness vary according to the characteristic of the surrounding matrices (Perault and Lomolino 2000).

Acknowledgements

We thank the Foundation for Research of the State of Minas Gerais (FAPEMIG) for the financial support (process CRA- RDP-00104-10) and the Universidade Federal de Alfenas-MG for the logistical support. We also thank the landowners for granting us permission to work on their properties. Dr Érica Hasui kindly produced Figure 1. We thank Nathan Phillips Smith, a native speaker, for reviewing aspects of grammar and style in English. Dr Érica Hasui, Dr Nelson Henrique de Almeida Curi, Dr Guilherme Garbino and 3 anonymous reviewers provided insightful comments which greatly helped to improve the manuscript.

Authors' Contributions

AARC, MP and RGTC designed the study; ARCC collected the data; AARC and MP conducted the analyses; MP identified the species and AARC; AARC, MP and RGTC wrote the manuscript..

References

Alves-Costa CP, Fonseca GAB, Christofaro C (2004) Variation in the diet of the brown-nosed coati (*Nasua nasua*) in southeastern Brazil. Journal of Mammalogy 85 (3): 478–482. https://doi.org/10.1644/1383945

Ayer JEB, Olivetti D, Mincato RL, Silva MLN (2015) Erosão hídrica em latossolos vermelhos distróficos. Pesquisa Agropecuária Tropical 45 (2): 180–191. https://doi.org/10.1590/1983-40632015v4531197

Bernardo PVS, Melo FR (2013) Assemblage of medium and large size mammals in an urban semideciduous seasonal forest fragment in Cerrado biome. Biota Neotropica 13 (2): 76–80. https://doi.org/10.1590/S1676-06032013000200008

Calaça A, Fachi M, Silva DA, Oliveira SR, Melo FR (2018) Mammals recorded in isolated remnants of Atlantic Forest in southern Goiás, Brazil. Biota Neotropica 19(1): e20180575. https://doi.org/10.1590/1676-0611-BN-2018-0575

Campanili M, Schäffer WB (2010) Mata Atlântica: manual de adequação ambiental. Série Biodiversidade, 35. MMA/SBF, Brasília, 96 pp. http://www.mma.gov.br/estruturas/202/_arquivos/adequao_ambiental_publicao_web_202.pdf. Accessed on: 2016-02-10.

Cerqueira R (2001) Um sistema de monitoramento e inventário da biodiversidade terrestre do Brasil. In: Garay I, Dias B (Eds) Conservação e biodiversidade em ecossistemas tropicais. Vozes, Petrópolis, 147–149.

Chiarello A (1999) Effects of fragmentation of the Atlantic forest on mammal communities in south-eastern Brazil. Biological Conservation 89 (1): 71–82.

COPAM (2010) Deliberação Normativa Nº 147/2010: Lista de espécies ameaçadas de extinção da fauna do Estado de Minas Gerais. http://www.siam.mg.gov.br/sla/download.pdf?idNorma=13192. Accessed on: 2016-07-29.

Costa LP, Leite YLR, Mendes SL, Albert DD (2005) Conservação de mamíferos no Brasil. Megadiversidade 1 (1): 103–112.

Cullen L, Bodmer ER, Valladares-Pádua C (2001) Ecological consequences of hunting in Atlantic Forest patches, São Paulo, Brazil. Oryx 35 (2): 137–144. https://doi.org/10.1046/j.1365-3008.2001.00163.x

Colwell RK, Mao CX, Chang J (2004) Interpolating, extrapolating, and comparing incidence-based species accumulation curves. Ecology 85 (10): 2717-2727. https://doi.org/10.1890/03-0557

Eduardo E, Passamani, M (2009) Mammals of medium and large size in Santa Rita do Sapucaí, Minas Gerais, southeastern Brazil. Check List 5 (3): 399–404. https://doi.org/10.15560/5.3.399

Emmons LH, Feer F (1997) Neotropical Rainforest Mammals: a Field Guide. University of Chicago Press, Chicago, 396 pp.

Fundação SOS Mata Atlântica and Instituto Nacional de Pesquisas Espaciais (2015) Atlas dos remanescentes florestais da Mata Atlântica: Período 2013-2014 [Relatório Técnico]. Fundação SOS Mata Atlântica and Instituto Nacional de Pesquisas Espaciais, São Paulo, 60 pp. http://mapas.sosma.org.br/dados/. Accessed on: 2016-08-03.

Galetti M, Giacomini HC, Bueno RS, Bernardo CSS, Marques RM, Bovendorp RS, Steffler CE, Rubim P, Gobbo SK, Donatti CI, Begotti RA, Meirelles F, Nobre RA, Chiarello AG, Peres CA (2009) Priority areas for the conservation of Atlantic Forest mammals. Biological Conservation 142 (6): 1229–1241. https://doi.org/10.1016/j.biocon.2009.01.023

IUCN (2018) The IUCN Red List of Threatened Species, Version 2018.1. International Union for Conservation of Nature. http://www.iucnredlist.org. Accessed on: 2018-12-15.

Machado FS, Moura AS, Santos KK, Mendes, PB, Abreu TCK, Fontes, MAL (2017) Registros ocasionais de mamíferos de médio e grande porte na microrregião de Lavras e São João del Rei, Campo das Vertentes, Minas Gerais. Revista Agrogeoambiental 9 (1): 35–44. https://doi.org/10.18406/2316-1817v9n12017930

Magioli M, Barros-Ferraz KMPM, Rodrigues MG (2014) Medium and large-sized mammals of an isolated Atlantic Forest remnant, southeast São Paulo State, Brazil. Check List 10 (4): 850–856. https://doi.org/10.15560/10.4.850

Melo-Dias M, Passamani M (2018). Mamíferos de médio e grande porte no campus da Universidade Federal de Lavras, sul do estado de Minas Gerais, Brasil. Oecologia Australis 22 (3): 234–247.

Ministério do Meio Ambiente (2014) Portaria nº 444/2014: Lista Nacional Oficial de Espécies da Fauna Ameaçada de Extinção. http://www.icmbio.gov.br/cepsul/images/stories/legislacao/Portaria/2014/p_mma_444_2014_lista_espécies_ameçadas_extinção.pdf. 29 July 2016.

Olivetti D, Mincato RL, Ayer JEB, Silva MLN, Curi N (2015). Spatial and temporal modeling of water erosion in dystrophic red latosol (oxisol) used for farming and cattle raising activities in a subbasin in the south of Minas Gerais. Ciência e Agrotecnologia 39 (1): 58–67. https://doi.org/10.1590/s1413-70542015000100007

Paglia AP, Fonseca GA, Rylands AB, Herrmann G, Aguiar LM, Chiarello AG, Leite YLR, Costa LP, Siciliano S, Kierulff MCM, Mendes SL, Tavares VC, Mittermeier RA, Patton JL (2012) Annotated checklist of Brazilian mammals, 2nd edition. Occasional Papers in Conservation Biology 6: 1–76.

Penido G, Zanzini ACdaS (2012) Checklist of large and medium-sized mammals of the Estação Ecológica Mata do Cedro, an Atlantic forest remnant of central Minas Gerais, Brazil. Check List 8 (4): 712–717. https://doi.org/10.15560/8.4.712

Perault DR, Lomolino MV (2000) Corridors and mammal community structure across a fragmented, old-growth forest landscape. Ecological Monographs 70 (3): 401–422. https://doi.org/10.1890/0012-9615(2000)070[0401:camcsa]2.0.co;2.

Pinto LP, Bedê L, Paese A, Fonseca M, Paglia A, Lamas I (2006) Mata Atlântica Brasileira: os desafios para a conservação da biodiversidade de um hotspot mundial. In: Rocha CFD, Bergallo HG, van Sluys M, Alves MAS (Eds) Biologia da conservação: essências. Rima, São Carlos, 91–118.

Pires DPS, Cademartori CV (2012) Medium and large sized mammals of a semideciduous forest remnant in southern Brazil. Biota Neotropica 12 (3): 239–245. https://doi.org/10.1590/S1676-06032012000300023

Prado MR, Rocha EC, Del Giudice GML (2008) Mamíferos de médio e grande porte em um fragmento de mata atlântica, Minas Gerais, Brasil. Revista Árvore 32 (4): 741–749. https://doi.org/10.1590/S0100-67622008000400016

Ribeiro MC, Metzger JP, Martensen AC, Ponzoni FJ, Hirota MM (2009) The Brazilian Atlantic Forest: How much is left, and how is the remaining forest distributed? Implications for conservation. Biological Conservation 142 (6): 1141–1153. https://doi.org/10.1016/j.biocon.2009.02.021

Santos KK, Pacheco G, Passamani M (2016) Medium-sized and large mammals from Quedas do Rio Bonito Ecological Park, Minas Gerais, Brazil. Check List 12 (1): 1830. https://doi.org/10.15560/12.1.1830

Silva LD, Passamani M (2009) Mamíferos de médio e grande porte em fragmentos florestais no município de Lavras, MG. Revista Brasileira de Zoociências 11 (2): 137–144.

da Silva LG, Ribeiro MC, Hasui É, da Costa CA, da Cunha RGT (2015) Patch size, functional isolation, visibility and matrix permeability influences Neotropical Primate occurrence within highly fragmented landscapes. PLoS ONE 10 (2): e0114025. https://doi.org/10.1371/journal.pone.0114025

Tomás WM, Miranda GHB (2003) Uso de armadilhas fotográficas em levantamentos populacionais. In: Cullen Jr L, Rudran R, Valladares-Padua C (Eds) Métodos de estudos em biologia da conservação e manejo da vida silvestre. Editora da Universidade Federal do Paraná, Curitiba, 243–268.

Trigo TC, Schneider A, Oliveira TG, Lehugeur LM, Silveira L, Freitas TRO, Eizirik E (2013) Molecular data reveal complex hybridization and a cryptic species of Neotropical wild cat. Current Biology 23 (24): 2528–2533.https://doi.org/10.1016/j.cub.2013.10.046

Wilcove DS, Rothstein D, Dubow J, Phillips A, Losos E (1998). Quantifying threats to imperiled species in the United States. Bioscience 48 (8): 607–615. https://doi.org/10.2307/1313420